

DESTINATION CARRYING CAPACITY, VISITOR
MANAGEMENT, AND ZONING STRATEGIES:

A Spatial Planning and Sustainable Tourism Management Proposal for Boracay
Island, Philippines

Planning and Management of Sustainable Tourism Spaces (M12)

Sustainable Project Plan – Final Project Report

Student Name_Abhishek kumar

Student ID _ DE240414

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Executive Summary

The rapid growth of tourism can exert serious pressure on the environmental quality, cultural identity and economic resilience of small islands and heritage sites. Although tourism offers jobs, business opportunities and income for the government, these advantages may become unsustainable if the number of visitors grows faster than planning, infrastructure and environmental protections can keep up. Too much tourism can lead to overcrowding, pollution, strain on water and waste systems, disruption of local communities and a decrease in visitor satisfaction. This report looks at carrying-capacity assessment, visitor management and spatial zoning as closely linked methods for dealing with overtourism and for safeguarding destinations that have high ecological and cultural sensitivity. The Philippines' Boracay Island is taken as the main example.

The report looks at both the Tourism Carrying Capacity Assessment (TCCA) and the Limits of Acceptable Change (LAC) approach. While TCCA looks at the physical, environmental, economic and socio-cultural limits of a destination, LAC starts by identifying the environmental and social conditions which should be protected, choosing indicators for measuring these conditions and then setting out the management actions to be taken when the acceptable standards are surpassed. In Venice entrance fees are used to affect the times at which visitors come. At Machu Picchu quotas are combined with timed admissions, designated routes and limitations on the size of groups. The Galápagos Islands apply ecological zoning and set visitor numbers according to the location and its environmental sensitivity. These examples show that visitor management is most successful when several measures are used together. Fees, quotas,

zoning, infrastructure, monitoring and enforcement all must be included in a coordinated system rather than work on their own.

Introduction

Tourism is often shown as a successful way of promoting economic development, especially in coastal, island and heritage areas. It has the ability to generate both direct and indirect jobs, promote investment, help out local businesses and provide money to public authorities.

Moreover, tourism can increase the visibility of places and lead to a greater desire to preserve cultural and natural sites. On the other hand, the same kind of growth which brings about economic advantages can also place a strain on the environmental and social resources which make a destination appealing.

Overtourism is usually linked to a situation where tourism activity exceeds the capacity of a destination to handle it. The problem is not just a matter of counting the number of visitors each year. The times when people arrive, the fact that visitors tend to congregate in certain areas, the duration of their stays and their patterns of behaviour all have an effect on the level of pressure. It is therefore possible for a destination to face serious congestion at some places or times even if the total number of visitors it receives each year seems to be manageable.

The report looks at how carrying-capacity assessment, spatial zoning and visitor-management measures can be combined in order to reduce these risks; Boracay Island in the Philippines has been chosen as the main example since its rapid tourism development, the environmental crisis it suffered and its closure in 2018 offer a suitable illustration of both the effects of unmanaged growth and the difficulties involved in introducing capacity controls once damage has already taken place.

The report has three primary aims. Firstly, it examines the environmental, socio-cultural and economic effects resulting from uncontrolled tourism development on Boracay. Secondly, it outlines the TCCA and LAC approaches and looks at the lessons that can be drawn from Venice, Machu Picchu and the Galápagos Islands. Thirdly, it suggests a sustainable planning framework for Boracay which is based on four spatial zones, a flexible visitor quota, differentiated pricing, participatory governance and measurable performance indicators.

2. The baseline concerning the destination and the assessment of its impact

2.1 Destination Profile

Boracay is located in the province of Aklan in the Philippines and is part of the municipality of Malay. The island's international reputation is closely linked to White Beach, a long sandy coastline which has become the focal point for accommodation, recreation and commercial tourism on the island.

Tourism started to speed up in the 1970s, and at first the visitors were mainly backpackers and people who were drawn to the island because of its beaches and the fact that it was rather undeveloped. With greater international recognition, demand led to investment in hotels, resorts, restaurants, transport services, entertainment facilities and other supporting businesses.

In the 2010s Boracay had become an internationally known case illustrating the effects of tourism pressure. The area along the beach and the neighbouring settlements had been

extensively developed, the public infrastructure was suffering and the island's natural systems were coming under increasing pressure from waste and wastewater. This situation shows the need for destinations to set up capacity limits before growth leads to crisis levels.

2.2 Environmental Degradation

The pollution of wastewater had an effect on the coastal waters and on the marine ecosystems. If sewage enters the environment without having been adequately treated, nutrients and pathogens can build up, which leads to a decline in water quality and places a strain on the aquatic systems. In the case of Boracay, pollution caused worries regarding algal growth, and the worsening of the conditions close to the shore.

The situation also gave rise to public-health worries. The fact that the quality of the coastal water had deteriorated showed that environmental failure was no longer just a matter of conservation; it had become an issue of sanitation and public safety as well. The intervention carried out in 2018 therefore went beyond merely improving the island's appearance and included tackling the basic environmental infrastructure.

The deterioration of the environment also posed a threat to Boracay's long-term tourism industry.

2.3 The socio-cultural and economic effects

The increase in tourism had an impact not only on the residents and workers of Boracay but also on the tourists who went there. Since there were more employment opportunities, people had

moved to the area from elsewhere, which in turn raised the demand for accommodation, transport, water, food, waste collection and other public services.

The quick rise in tourism changed the island's cultural identity. Instead of the loose and informal atmosphere that had existed during the earlier backpacker era, there came a heavy concentration of resorts, restaurants, entertainment businesses and commercial operations. This shows that there is a more general issue connected with overtourism, namely that the features which first attract tourists can be undermined by the extent of tourism.

2.4 The 2018 Closure

The Philippine government began a six-month rehabilitation period by closing Boracay to tourists on 26 April 2018, after growing concerns had been expressed about the environmental conditions, the presence of illegal structures and the lack of adequate wastewater infrastructure.

The figure relating to capacity was important since it tried to link up the number of tourists with the existing infrastructure and environmental limits. When the site reopened in October 2018, new requirements were introduced in the areas of accommodation, environmental compliance, sewerage, land use and visitor management.

Capacity figures, though, can become contentious when tourism businesses think that improvements to the infrastructure ought to allow for a higher number of visitors. This pressure shows how important it is to have an independent review procedure. Should capacity be altered repeatedly without clear technical criteria, then the concept may end up losing its credibility.

Theoretical and Spatial Planning Framework

3. Theoretical and Spatial Planning Framework

3.1 The assessment of tourism carrying capacity

The concept of carrying capacity has its origins in environmental management, recreation planning and ecology. Broadly speaking, it means the degree of use which an environment can handle without suffering unacceptable deterioration. In the case of tourism, the idea has been modified so as to take into account not only the ecological effects but also the infrastructure, the economic conditions, community attitudes and visitor satisfaction.

The assessment of tourism carrying capacity refers to the highest level of tourism that can be taken on without leading to unacceptable environmental, physical, economic or socio-cultural effects. Unlike the approach used in Mediterranean tourism planning, which looks at several different aspects, it does not regard capacity as a single figure.

The extent to which tourism contributes to sustainable local prosperity is what economic capacity looks at. It does not follow that a high number of visitors means that the communities benefit fairly. When tourism results in low-paid jobs and at the same time raises housing and living costs, economic pressure can increase even if there is high tourism revenue.

One of the main benefits of TCCA is that it enables planners to determine the real constraint. For example, an island might have sufficient hotel rooms but still lack water, or it might have enough physical beach space but not adequate sewage treatment, or it might have high levels of visitor spending yet see a drop in resident satisfaction. Hence, a capacity assessment should look at the weakest or most critical system rather than depending solely on the supply of accommodation.

TCCA also has its limitations. Environmental and social conditions vary from season to season, and the impact of visitors will depend on where they go, how long they stay and the way in which they behave. It follows that a numerical estimate should be regarded as a tool for planning rather than as an absolute scientific truth. In order to find out whether the assumptions on which the capacity estimate is based are still valid, regular monitoring is essential.

3.2 The limits of acceptable change

The framework known as the Limits of Acceptable Change was in part created as a response to worries that traditional carrying-capacity methods placed too much emphasis on establishing a single maximum number of visitors. LAC starts with the environmental and social conditions that a destination wishes to keep.

The usual procedure is to determine the key values, specify the desired conditions, choose measurable indicators, set up standards and keep an eye on any changes; when an indicator goes beyond an acceptable threshold then the managers put into effect a pre-determined response.

On Boracay it is possible to combine TCCA and LAC effectively, since TCCA can be used to identify the island's infrastructure and resource limitations, and LAC can be used to define the environmental and social conditions that should be kept and to set up responses in the event that these conditions deteriorate.

3.3 Spatial Zoning

Spatial zoning puts the principles of carrying capacity into practical rules regarding land use.

Rather than imposing the same requirements over the whole area, zoning takes into account the fact that different regions have different levels of environmental sensitivity and different development potential.

Sensitive ecosystems can be given a high level of protection, while intensive tourism can be focused on areas that have the appropriate infrastructure. Zoning can be used to regulate construction, access, the number of visitors, business activities, transport and environmental requirements.

Possible categories could be strict conservation areas, restricted ecological areas, regulated tourism zones, residential or mixed-use areas and buffer zones, with each category having clear rules.

For zoning to be effective it is necessary to have accurate boundaries, permits, inspections, monitoring and penalties. If there is no enforcement, then zoning will remain merely a formal map and not a working system of management.

3.4 Proactive and reactive management

The use of TCCA, LAC and zoning together shows the distinction between reactive and proactive destination management.

By setting thresholds, applying zoning rules, installing monitoring systems and establishing enforcement procedures beforehand, proactive management also makes it a practice to review policies regularly in order to adapt them as the circumstances change.

It is especially advantageous to carry out proactive planning in the case of islands since the amounts of land, water, the capacity for waste processing and the transport systems are usually limited. Taking action early on can stop small problems from turning into costly or irreversible failures.

4. International Comparative Case Studies

4.1 Venice, Italy

In 2024 Venice charged day visitors five euros on certain high-demand dates and during specific periods by means of a digital registration system, while residents, workers, students and a large number of overnight guests were exempt.

In 2025 the programme was made larger so as to include more busy days, and the fee might go up for people who made their arrangements just before hand. The aim was to get visitors to select less crowded times and to raise funds for the purposes of managing the city.

The case of Boracay shows that an environmental or access charge should be accompanied by a clearly established limit on the number of visitors. While pricing can help to redistribute demand and provide funding for management, the infrastructure and ecological limits still need direct regulation.

4.2 Machu Picchu, Peru

Machu Picchu illustrates how it is possible to combine limited visitor numbers with timed entry and the management of routes according to space. Concern has been expressed because of the increasing number of visitors regarding the risk of physical deterioration and the pressure being placed on the delicate archaeological features.

The authorities-imposed restrictions on the number of visitors and later improved the system by introducing designated circuits and scheduled entries. Visitors are then guided along specific routes, which helps to reduce the number of people gathering at vulnerable sites.

Seasonal restrictions and various circuits, each with specific features and lengths, have also been employed. Regulations have been put in place regarding group sizes and the arrangements for guidance, and some sensitive sites can only be accessed via certain routes or within specified periods.

The advantage of taking the Machu Picchu route is that it doesn't depend solely on a single daily figure; instead, it regulates where visitors go, when they enter and how they are grouped. As a result, it decreases the chance that a large number of visitors will gather at one particular sensitive spot.

4.3 Galápagos Islands, Ecuador

The Galápagos Islands are an example of a long-term ecological zoning approach, and the national park has applied visitor-area classifications which differentiate between locations on the basis of their ecological sensitivity and the levels of use allowed.

The rules about access, group size, activities, and the types of vessels vary from one visitor's site to another, with more sensitive sites being able to take only small groups whereas those that are more resilient can handle a more intensive level of use.

The Galápagos experience also shows how important it is to have long-term funding for conservation, along with monitoring and governance. Visitor management only works when the rules are backed by institutions which are able to enforce them and by financial resources that allow conservation programmes to be maintained.

4.4 Comparative Lessons

The three examples together offer complementary lessons: Venice illustrates that fees can affect the timing of tourism but do not necessarily determine the total number of visitors; Machu Picchu shows the value of combining quotas with timed entry, route controls and group restrictions; and the Galápagos Islands demonstrate how zoning and location-specific limits can take into account differences in environmental vulnerability.

5. Analysis of stakeholders and policy

5.1 National and Local Government

The national government agencies have a major role to play in environmental regulation, in tourism policy, in carrying-capacity assessments and in large infrastructure programmes. The

relevant bodies are the Department of Environment and Natural Resources, the Department of Tourism and the inter-agency structures set up for the purpose of Boracay rehabilitation.

The Malay Local Government Unit plays a key role in dealing with local permits, regulating businesses, and carrying out and enforcing land-use policies. In order for destination management to be effective, the various levels of government should co-ordinate instead of operating via separate systems.

5.2 Tourism Businesses

Hotels, resorts, restaurants, tour operators and other businesses have a direct reliance on tourism demand. Greater numbers of visitors can lead to higher sales, more employment opportunities and increased investment, which gives these businesses a valid reason to be involved in capacity discussions.

A transparent technical review can address these interests by giving businesses the chance to submit evidence and to point out possible improvements to the infrastructure, but any decision to alter capacity must be based on published environmental and infrastructural criteria and not merely on commercial pressure.

5.3 Residents and Workers

Both residents and people who work in the tourism industry are affected directly by the benefits and drawbacks of tourism; while they may obtain job opportunities and business prospects they also have to cope with pressure on housing, congestion, higher living expenses and changes to local community areas.

It is therefore necessary for them to take part in the drawing up of the restrictions and in deciding how the revenue from tourism should be distributed.

People who live in the area and the staff should have official representation as part of the proposed system of governance. Participation must not be restricted to being consulted occasionally after major decisions have already been taken.

5.4 Visitors

The people who visit the destination are the main users of it and are directly impacted by the quotas, fees, access rules and zoning regulations. Also, the way visitors behave has an effect on the environmental impacts.

5.5 Policy Gaps

The history of Boracay points to two major flaws in its policy. The first of these was poor enforcement; although regulations were in place, illegal constructions and businesses that were not in compliance kept on operating. This demonstrates that a rule fails to be effective when inspections and penalties are not sufficient.

A second weakness was the lack of a properly stable and autonomous body responsible for reviewing capacity. When the infrastructure had been improved, discussions regarding increasing the number of visitors became subject to the claims of various economic and environmental interests.

It is therefore necessary for a good system of governance to separate the technical assessment from short-term political and commercial pressure while at the same time ensuring that stakeholders have a meaningful degree of participation.

6. Strategic Sustainable Planning Proposal

The management system that has been proposed consists of four interrelated parts: a four-zone spatial structure, a varying visitor quota, different access fees and a permanent governing body.

6.1 Area A: Core Conservation Area

Zone A should include the sensitive mangroves, wetlands and the important near-shore reef areas and it should have the most stringent development restrictions.

Access will be allowed only for approved low-impact activities, with guided visits where this is appropriate. The size of groups and how often they visit will be limited based on ecological monitoring.

Commercial buildings would not be allowed in areas that are sensitive. Indicators of this would be the quality of the water, the level of biodiversity, the condition of the mangroves, the health of the reef, and signs of disturbance by visitors.

Where it was found that the ecological conditions were getting worse, the managers could reduce access or temporarily close certain sites.

6.2 The B zone: the area along the beach that is subject to regulation

Zone B should include White Beach and the main resort area. Tourism will continue to be concentrated in this area since it is already developed, but commercial activity and new building will be controlled.

The requirements regarding shoreline setbacks would be put into effect, covering the buffer zone set up as part of the rehabilitation process after 2018. Any buildings or activities which interfere

with the public's access to the beach, damage the coastal environment or cause excessive congestion would be subject to restriction.

Beachfront businesses would need the correct licences and have to meet environmental requirements. Commercial activities could be arranged in accordance with the available space, public access and the environmental conditions.

The carrying capacity of the beach would be determined by referring to the usable area of the beach and by using an agreed minimum amount of space for each person. This figure would then be compared with other limitations, for example those relating to water, wastewater, transport and resident tolerance. Management should be guided by the most restrictive of the relevant thresholds.

6.3 The C zone: a residential and mixed-use area

Zone C should contain the main residential and commercial areas, together with accommodation, restaurants, public facilities and transport services.

The infrastructure investment would be focused on these areas, with priority given to central sewerage connections, wastewater treatment, drainage, freshwater supply, waste collection, public transport and worker accommodation. Housing must also be taken into account in planning since tourism could not be made sustainable if the people who support it are unable to get affordable accommodation.

6.4 The D zone: buffer and transition area

Zone D would provide for a controlled transition from developed areas to conservation areas and would allow development only where the environmental impacts can be managed and the infrastructure capacity has been verified.

New projects would have to undergo an environmental assessment and would also have to provide evidence as to whether wastewater and other essential services could be carried out. Those developments which affect wetlands, natural vegetation or drainage paths would be subject to extra examination.

6.5 Dynamic Visitor Quota

The capacity figure obtained as a result of the 2018 rehabilitation can be used as a preliminary reference, but it must not be considered as final. A technical panel should carry out a formal review every two years.

The review needs to evaluate the availability of fresh water, the capacity for wastewater treatment, the processing of solid waste, the use of the beaches, the transport infrastructure, the environmental conditions, resident satisfaction, the visitor experience and the requirements regarding accommodation or the workforce.

The quota should only be increased when it can be shown that the infrastructure and environmental systems are able to safely handle the extra demand. Any improvements must be verified independently and not taken on trust.

Seasonal adjustments could also be made; visitor numbers could be lowered when there is high ecological vulnerability or exceptional congestion and adjusted during periods of lower pressure if there is evidence to support the change.

6.6 Differentiated Access Fees

A tiered environmental fee could be used in conjunction with the quota, with overnight visitors having to pay a standard amount while those arriving during peak times on a day visit paying a higher amount. A greater fee could be applied in the case of very late bookings in order to promote earlier planning and to help spread out the demand. Revenue must be put into a special environmental fund, and the areas in which it is spent could be wastewater maintenance, water-quality testing, beach rehabilitation, reef and mangrove restoration, solid-waste reduction, enforcement and visitor education.

A fee-only method contrasted with the suggested system, which would make use of pricing as a supplementary measure. The quota would restrict the total demand, while pricing would affect the timing and also provide funding for destination management.

6.7 Governance and Enforcement

A permanent body made up of many stakeholders should be in charge of the system, and this body should consist of representatives from the environmental and tourism agencies, the Malay Local Government Unit, the tourism industry, the residents, the workers, and independent technical experts.

The data should be gathered by an independent technical secretariat, capacity calculations carried out, the relevant indicators monitored and annual reports published. The methodology employed in recommending changes must be made publicly available.

Accommodation establishments, buildings, connections for the disposal of wastewater, waste systems and activities taking place on the beaches should all be the subject of regular inspections. Penalties must be clear and applied in a consistent manner.

If the violations are repeated, the company could be fined, its permits suspended or it could be closed down. It is important that enforcement is applied equally to both large and small operators in order to preserve credibility.

People who live in the area and the workers should have official representation, with the opportunity to vote where this is suitable. This would help to increase community involvement and support the principle of participation promoted by LAC.

7. Action Plan

Action Plan, Monitoring and KPIs

Phase One: the first six months

The first stage ought to set up the permanent governing body and clearly define the responsibilities of the various agencies. A revised carrying-capacity assessment should look at the physical, environmental, economic and socio-cultural conditions.

7.2 Stage Two: from month 7 to month 12

In the second stage, access fees and permits should be introduced at the existing arrival points, and a detailed audit of the wastewater system should be carried out to assess the current treatment capacity and to identify any gaps in the infrastructure.

Enforcement of shoreline setbacks and the rules relating to conservation zones should be carried out by the authorities, and tourism businesses should have valid approvals, suitable connections for their wastewater and waste-management arrangements that comply with the relevant regulations.

Phase Three: from month 13 to month 24

The focus in the third stage should be on the infrastructure improvements spotted in the wastewater and capacity assessments, and these could involve sewerage connections, upgrades to treatment facilities, drainage projects and better solid-waste facilities.

The first formal quota review should be carried out by the independent technical panel, and its results should be included in an annual public report which shows performance for each indicator.

7.4 The fourth phase: from month 25 onwards

After the initial two years the system should enter a permanent phase of adaptive management.

The capacity review should take place every two years, and the environmental and social indicators should be monitored either continuously or annually according to the indicator.

The development proposals for Zone D must still be subjected to environmental and infrastructure assessments. Digital visitor management tools could give real-time information on the number of arrivals, on the available capacity and on the level of congestion.

7.5 Environmental Indicators

Environmental performance must be assessed in terms of coastal and lagoon water quality, the proportion of businesses connected to approved sewerage systems, the volume of wastewater treated, the amount of mangrove restoration carried out, the condition of the reefs, the quantity of solid waste generated per visitor-night, the number of environmental violations and the extent of shoreline change.

7.6 Social Indicators

The social measures ought to consider resident satisfaction, housing affordability, the proportion of tourism jobs held by residents, worker income and employment stability, community participation, complaints concerning noise and congestion, and access to public spaces.

Social monitoring matters because protecting the environment by itself does not make tourism acceptable to residents.

7.7 Economic Indicators

The analysis of the economy should look at tourism revenue, the amount spent by visitors, income from environmental fees, the proportion of environmental revenue that is spent on conservation, tourism employment, occupancy during peak and off-peak times, and the amount of tourism income that is kept in the local area.

7.8 Governance Indicators

Governance performance must take into account the number of unpermitted businesses spotted, the number of violations put right, compliance with zoning and shoreline requirements, the publication of monitoring reports, the completion of the scheduled capacity reviews, adherence to the technical methodology, external auditing, and stakeholder representation.

7.9 Monitoring and Intervention

The governance body must have the monitoring results regularly provided to it and should issue annual summaries. A full carrying-capacity assessment should be carried out every two years.

Yet serious problems need not be postponed until the two-year review; if a critical environmental threshold is passed then an immediate response should be possible. For instance, continual failures in water quality could lead to a temporary decrease in the number of visitors, to restrictions on certain activities or to faster repairs of the infrastructure.

The system embodies the main principle of LAC regarding indicators, namely that they should be linked to management action. Monitoring proves to be of little use if the relevant authorities gather information without taking action when the standards are breached.

8. Conclusion and Recommendations

The case of Boracay shows the dangers involved in letting tourism development move forward faster than appropriate infrastructure, planning, monitoring and enforcement. The environmental problems on the island were not the result of tourists simply being there; they were due to a combination of rapid development, illegal buildings, insufficient sewage and waste systems, population increase, poor regulation and the high degree of concentration of tourism activity.

The management lessons that can be drawn from the international examples are complementary. Venice shows the extent to which access charges can be used to affect the timing of visits, yet it also proves that pricing by itself does not always manage the total level of tourism pressure. Machu Picchu shows how visitor quotas can be reinforced by means of timed entry, designated circuits and limitations on group size. The Galápagos Islands show the benefits of ecological zoning and the introduction of site-specific limits which take into account the different levels of environmental sensitivity.

The visitor limit ought to be looked at every two years by means of an independent technical procedure and any changes must be based on tangible evidence relating to water, wastewater, waste, transport, environmental conditions and community wellbeing. Simply because businesses ask for it or because there is high tourism demand should not be enough reason to approve an increased capacity.

People who live in the area and the workers concerned should also have their representation secured within the governance of the destination. Their involvement must be continuous and connected with real decision-making rather than being restricted to consultations that take place after the policies have already been drawn up.

A system that is to be successful must therefore be based on four principles: evidence-based capacity assessment, spatial differentiation, continuous monitoring and accountable governance. Only when these principles are all put into practice can Boracay make the transition from crisis-driven intervention to a more proactive approach to destination management.

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Appendices

Appendix A: Summary of Comparative Case Instruments

Venice — Instrument: variable day-tripper access fee (€5–€10). Basis: peak-date demand smoothing without a hard numerical ceiling.

Machu Picchu — Instrument: seasonal daily cap (4,500–5,600) with timed, circuit-based zoning. Basis: periodically reviewed technical threshold combined with spatial routing.

Galápagos — Instrument: site-level zoning (extensive-use, intensive-use, recreational) with a park-wide zero-growth policy aspiration. Basis: ecological fragility classification applied since 1973–1974.

Boracay (2018) — Instrument: island-wide numerical cap (19,215 present at one time) established during a six-month closure. Basis: reactive determination following environmental crisis.

Appendix B: Proposed Boracay Zone Summary

Zone A (Core Conservation): mangroves, wetlands, near-shore reef — guided access only, small-group limits.

Zone B (Regulated Beachfront): White Beach frontage — licensed commercial activity, enforced shoreline easement, physical carrying capacity limits.

Zone C (Township / Mixed-Use): commercial and residential core — priority infrastructure investment, sewage connection required.

Zone D (Buffer / Transition): lower-density interior areas — development subject to environmental impact assessment and infrastructure precondition.

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